

ON DISARTICULATION AT THE HIP JOINT AND
ON A NEW MODE OF DOING IT.

By C. B. KEETLEY, F.R.C.S.,

OF LONDON.

SENIOR SURGEON TO THE WEST LONDON HOSPITAL, SURGEON TO THE
SURGICAL AID SOCIETY.

IT would scarcely be inaccurate to say that a few years ago the spectators assembled in a hospital theatre where amputation through the hip joint was about to be performed, regarded themselves rather as come to witness a sensation and a display of dexterity than as being present to quietly study a means of saving life. They knew too well how small the chances were possessed by the patient, I had almost said the "victim," of preserving the life for which he was about to sacrifice a whole limb.

But the extraordinary surgical activity of our time has transformed all this, and it is difficult to decide which is the more astonishing, the rapidity or the thoroughness of the change.

The fatality of the operation as formerly practised was mainly due to three things, namely, shock, haemorrhage, and the dangers associated with an immense, suppurating and septic surface. Each of these enemies has been reconnoitred, attacked and repulsed, if not crushingly defeated, and the whole battle fought so far with science and fore-thought, blind fortune having no more to do with the matter than she had to do with the plans of Moltke and Bismarck in 1870.

The first evil to be dealt with was the haemorrhage, and the first important step with regard to it was the invention of the large tourniquet for compression of the abdominal aorta. This goes by Lister's name and the form in common use is undoubtedly due to him. But he does not claim to be the first surgeon to compress the aorta during amputation of the thigh,

and a tourniquet for compressing the abdominal aorta for general purposes was invented many years ago by an old student of St. Bartholomew's Hospital. The late Mr. Holmes Coote used to shew it in his lectures. The first person to recommend and to employ the aortic tourniquet during disarticulation of the hip was Professor Pancoast of Philadelphia.

Esmarch introduced the principle of elasticity into aortic compression. He did not, however, allow his elastic bands to constrict the whole trunk as they do the limbs, but confined the pressure almost entirely to the region of the great vessels by placing a long traverse bar of iron or wood across the patient's back and attaching the compressive elastic bands to the ends of the bar, so that the bands bore to the bar the same relation that a bowstring does to a bow, and the patient's waist lay between the two.

In May, 1878, Mr. Richard Davy described his lever for compressing the iliac artery or the aorta, per rectum. The directness of action, the handiness, simplicity and other obvious advantages of this instrument at once brought it into favor; and it has ever since done great service. But unfortunately one or two serious accidents have attended its use.

Again, Esmarch's band may be used in the ordinary way if a pad be placed over the iliac artery beneath the rubber tourniquet and an assistant prevent the latter from slipping downwards by holding firmly loops of bandage placed beneath the tourniquet before and behind. Mr. Jordan Lloyd was one of the first surgeons to adopt this plan, which I am inclined to think has advantages over all others.

In the Glasgow Medical Journal for 1881, page 150, is noticed a method of using what might be termed a kind of acupressure on a large scale. This consists of transfixing with a steel rod and passing a figure of 8 elastic band over its ends. This was devised by Newman and Trendelenburg, independently.

But, in their endeavors to lessen the haemorrhage associated with this formidable operation, surgeons have not confined their attention to tourniquets and bandages. The method of operating has been greatly governed by the same influence, and in various ways.

At one time it was thought enough to operate quickly and that a smart assistant should be ready to instantly seize the upper flap and control the vessels. To this period belongs the historical anecdote of the dashing operator who slashed off his assistant's fingers and the tail of the chloroformist's coat.

I hope I shall not be thought to throw ridicule on speed in amputating.

One of the first operative procedures specially planned with a view to lessen haemorrhage was that of commencing with ligation of the femoral artery through a longitudinal incision over that vessel. Among the advocates for this were Roser, Pitha, Volkmann, Verneuil and Koenig. Most of these also ligatured the vein. From the lower end of the longitudinal incision a circular cut was carried round the limb. The amputation was consequently what is known as an oval one.

König points out that the incision made with a view to resection can in a similar way be turned into that for an oval amputation, if upon bringing the joint into view, the surgeon prefers exarticulation to excision. (Text-book of Special Surgery, Vol. 2, p. 898, 1879.) Spence had long before written similarly of the shoulder joint.

It is thus obvious that the times were ripe for the further advance, a most important one, which was now made by Mr. Furneaux Jordan.

The Birmingham surgeon grasped the position in a manner which all who know him will recognize as characteristic, and in a case described in the *Lancet* for March 22, 1879, he amputated through the thigh after disarticulating the bone through an external longitudinal incision.

Thus what König had pointed out as merely a plan available under exceptional circumstances, Jordan advocates as the right procedure for general use; and I believe that further experience has only tended to support Jordan's view.

In justice to Volkmann, it should be stated that the latter, according to König, had already recommended an operation similar to that of Jordan, but with the two stages inverted. That is to say, first a circular amputation was done through the middle of the thigh and then the upper part of the femur was extirpated. The disarticulation was directed to be done superiosteally, an undoubted improvement.

But, in the volume from which I am quoting it is not made clear that either Volkmann or König had ever done this operation which the former recommends and the latter warmly endorses.

Lister, in Holmes's System (3d edition, 1885), relates that many years ago an operation precisely similar to Volkmann's, except that it was not superiosteal, was done by one of his (Lister's) colleagues in the Glasgow Infirmary. The patient suffered from malignant sarcoma of the femur, and the surgeon began by amputating through the thigh in the hope that the upper part of the femur might not be diseased. Mr. Lee also in the *Lancet* for 1866 recorded a case in which he transformed an incision for resection into an oval amputation.

But these cases seem to have been merely instances of resource under special circumstances.

The credit for the new operations should plainly be given to Jordan and Volkmann.

Luening and Rose recommend that the femoral vessels should be encircled by a double ligature and afterwards divided between. As the operation progresses, the vessels in the soft parts are tied both centrally and peripherally, so that bleeding is stopped in the anterior flap before the posterior is cut.

It is unnecessary to point out that most, if not all, of the above proceedings are meant to lessen shock as well as haemorrhage. The diminished shock is partly due to the lessened haemorrhage and partly to the amputation removing less of the soft parts of the limb and partly to the extent of cut surface being far less than that which results from the common flap amputation. If care be taken to adopt all the haemostatic measures now at the surgeon's disposal, I believe it will be found that more shock results from the process of removing the upper extremity of the femur from its bed than from the amputation through the soft tissues of the thigh. This was very noticeable in the case I shall relate presently. According to my experience, resection of the hip is always attended with more or less shock, whereas I have frequently seen amputation of the thigh produce very little. It is, perhaps, mainly dependent on the amount of haemorrhage.

Besides the avoidance of shock and haemorrhage there is another indication of equal importance, namely, to amputate in the way most calculated to protect from septic influences. The old operation had the vile effect of making an immense wound which lay in immediate proximity to the anus in both sexes and to the vagina in the female. Every form of the oval method has an immense advantage in this respect.

All that which may be termed the resection part of the wound can be immediately obliterated by buried sutures, hare lip pins and the like, for it is a simple longitudinal cut, the opposite surfaces of which fit together perfectly.

There is *another indication* only of less importance than those already considered, because it is not concerned with the saving of life. I refer to *the desirability of obtaining a stump which will permit the wearing of a useful artificial limb*. This indication was wholly unfulfilled by the old flap operation.

Ollier and others have been strongly of opinion that this object would be satisfactorily fulfilled by operating subperiosteally. Thus they said new bone would be formed in the stump; and new bone is undoubtedly formed in such stumps, but only to a very small extent. Moreover, the muscular attachments were less wholly disordered, so that such stumps are firmer, stronger and more fleshy. For all that, what I have observed in two such cases, and indeed in very high amputations through the thigh bone, convinces me that the results of subperiosteal exarticulation of the hip are scarcely if at all better than those of the old operation. One of the best of these stumps belongs to a patient of a surgeon who presented the man with a beautiful artificial limb made by one of the best makers in London. When the poor fellow does take his limb about with him, not a frequent occurrence, he carries it under his arm. All such patients use and prefer crutches.

I will now bring this somewhat long critical and historical introduction to a close and proceed to relate a case of my own.

On April 24th of this year, 1885, at the West London Hospital, I was about to disarticulate the hip of a girl named Clara Davies, aged 13. She suffered from hopelessly advanced *morbus coxae* with amyloid disease, albuminuria and general ana-

sarca to a marked degree. Her legs were swollen to an enormous size, and her face was puffed to a corresponding degree.

I formed a plan of action based upon the following main considerations and certain subsidiary ones.

1. Even after subperiosteal disarticulation, the patient seldom or never uses the artificial limbs provided for him, the stump being practically as useless as after the flap operation.

2. However far down the shaft of the femur the disease may have extended it is generally confined to the medulla.

3. The entire medulla can be safely removed from the shaft of the femur and the cavity treated with powerful germicides.¹

4. *If, in a case of exarticulation of the hip, the operation be divided into two parts done on separate days, so that the patient have time to recover from the shock of one before the other is inflicted on him, he will be more likely to survive than if the total shock is given at one operation.*

An important subsidiary consideration in connection with *morbus coxae* is that the discharging apertures, however numerous, are generally entirely those of tubular sinuses which can be scraped out, disinfected and threaded with large drainage tubes.

Accordingly, I first excised the trochanteric part of the femur with the remains of the head, at the same time dealing with the acetabulum, and scraping out all the sinuses, inserting large drainage tubes freely. Owing to the depth of the parts, the incision for this was nine inches long.

Forty-eight hours afterwards I amputated through the femur near the junction of the shaft with the lower epiphysis, and after scraping away all the medulla, used iodoform freely, and closed the amputation wound with buried sutures, uniting periosteum, muscles, and skin flaps separately.

The following notes are by the house surgeon, Mr. Warner.

"April 24, 3:30 p. m.—Patient was brought down into theatre and put under ether. Mr. Keetley made an incision over the situation of the femur from about two inches above the trochanter, extending nine inches down the thigh. He cut through the tissues and came down upon the femur, the upper part of which was in a state of necrosis.

¹ See *Annals of Surgery*, Jan., 1885.

He removed the upper third of the femur with bone forceps, separating the periosteum and leaving it. He then scraped the acetabulum and all the sinuses. Drainage tubes were inserted into the latter and one large one, $\frac{1}{2}$, inch in diameter, into the wound. Two sponges soaked in sublimate solution were packed respectively into the opposite ends of the wound to check oozing from the bone. All the sinuses and the wound were copiously syringed with sublimate solution, and into the latter iodoform was freely dusted. The lips of the wound were united with hare-lip pins, with intervening interrupted sutures. The whole was dressed with sero-sublimate gauze and an elastic bandage applied."

Great pains were taken to prevent haemorrhage. Owing to dropsical distension, the lips of the wound were very thick and there was great tension on the hare-lip pins and sutures.

"9:30 P. M.—Temp. 98, pulse 126. Patient vomited twice after taking milk and brandy, but otherwise rallied well and was comfortable. There was considerable oozing of serum. The draw sheets had to be changed. Weight and extension applied.

"25th.—Patient has passed a comfortable night. Slept well. She is comfortable and cheerful this morning. Pulse 162. Temp. 100.

"April 26th.—Had a very good night and slept well. Edema of the face much less. Escape of dropsical fluid from leg still persistent. Pulse 150. Temp. 98.8. No pain. The patient having been put lightly under the influence of ether and an Esmarch's coil having been applied, Mr. Keetley amputated the thigh through the lower third, cutting short antero-posterior flaps. He made the anterior flap first, then cut through the bone, the periosteum having been retracted, and then made the posterior flap. There was very little bleeding, only three arteries having to be secured. There was a very great effusion of dropsical fluid. The medullary cavity of the remaining part of the femoral shaft was now scraped out with a Volkmann's spoon, which removed a pulpy degenerated mass. The hollow cavity having been treated with iodoform, the periosteum was united with catgut sutures, over the end of the bone. The muscles, etc., were also united by buried sutures, and the tissues from within outwards were in the same way united to each other. A short drainage tube was inserted and the skin edges joined by silver sutures. The stump being supported and raised, the large drainage tube was removed from the excision wound and the finger, passed in at that spot, used to withdraw the two sponges. They had now been drawn near together by the retraction of the portion of femur towards the acetabulum. The lower sponge was firmly adherent in its place and had to be loosened carefully. The large drainage tube was re-inserted.

The patient bore the operation remarkably well. The pulse remained strong and not more frequent than in the morning. The temperature, which last night had reached 101, was this evening only 100.

"April 27th.—Has passed a very good night. P. 162. Temp. 98.8. Quite cheerful. Good appetite, eating fish and pudding. Evening: Pulse 144. Temp. 99.6."

After this time, for a month, the temperature only once rose above 99, and then only to 99.6. The pulse also diminished in frequency and the albumen in amount, the latter from one-fourth to one-eighth, and then, in the third week, to a trace, and before the fourth week to nothing. On the twenty-sixth day it reappeared and tended to increase.

It was on the twenty-third day after the first operation that she was attacked with a diarrhoea which afterwards continued and resisted, with obstinacy, all efforts to check it. Three days afterwards the return of albumen in the urine was noted; the amount, one-sixth. The remedies tried were bismuth, catechu, aromatic chalk powder, nitro-hydro-chloric acid, sulphuric acid and, cautiously, small doses of opium. The lotion which had been used to wash out the sinuses when the wound was dressed was sublimate (1 in 1000).

The notes of the case do not state when the drainage tubes were removed. I was away from England during the whole of this first month following the operation. When I returned I felt convinced that her only chance lay in removal from the town hospital to the sea-side. I fitted a fenestrated plaster case on the waist, hip and stump, got her up and prevailed on her friends, who were much better off than the ordinary class of hospital patients, to take her out every day for an airing in a perambulator, but they declined to pay the expense of sending her to Margate, where she ought to have gone. After a month of this, the diarrhoea continuing all the time, I sent her home. Although this was into the heart of London, the change seemed to benefit her at first. The urgent way in which I put the question of sending her to the sea-side to her father (the unfortunate little thing had no mother) made him impatient of my advice, and during the last month of her existence she had practically no medical treatment. One of my dressers used to occasionally call to see her, but I doubt if his advice was followed.

I do not think myself that her death was to be attributed to the operation. I believe that if my health had permitted me to carry out my own plans myself, and the family circumstances of the child, which I can scarcely explain in this paper, had been different, her life might have been saved.

The operation was only a part of my complete plan. The whole was as follows:

(1) After doing the operations, to leave in the drainage tubes for several weeks and indeed only remove them very gradually, making sure that the sinuses were closed up behind them.

(2) To use perchloride lotion only for the primary disinfection, afterwards relying on bismuth, zinc sulphate and, if necessary, other astringents to dry up the wound.

(3) Within the first fortnight to fix the hip with plaster of Paris, even if the quantity of discharge should demand the construction of a fresh case twice a week.

Bismuth, zinc sulphate and fixation by plaster of Paris are three all but all-powerful agents for stopping discharge.

Lastly, I only operated on the distinct understanding that the child was, when I should direct it, to be sent down to the neighbourhood of Margate, the best locality in England for such cases, where, moreover, there was a surgeon on whom I could rely for the enthusiastic seconding of my plans.

But the fates fought against me.

Of course, a complete and decisive explanation of the case and the diarrhoea which undoubtedly brought about the end, is, in the absence of a post-mortem, impossible.

Was the diarrhoea due to tuberculous disease of the intestine, or to amyloid disease, or to septicaemia, or to sublimate poisoning?

It should be stated that the evening temperature throughout the second month was almost invariably 99, except that it five times rose to 100.

The diagrams will explain the operation, if "C" is understood to point out the situation of the acetabulum, and "A" the upper point, and "B" the lower point of section of the femur. Only very short flaps are required, as the muscular retraction acts mainly to draw the bone preserved up to the acetabulum.

The operation would doubtless be applicable to some cases of injury.

In growing children the lower section might be made through the condyles below the epiphysial cartilage. Or the

amputation might be done through the knee-joint. In either case, there are two modes of dealing with diseased medulla, viz:—

(1) The medullary cavity is reached from below by piercing the lower femoral epiphysis between the condyles.

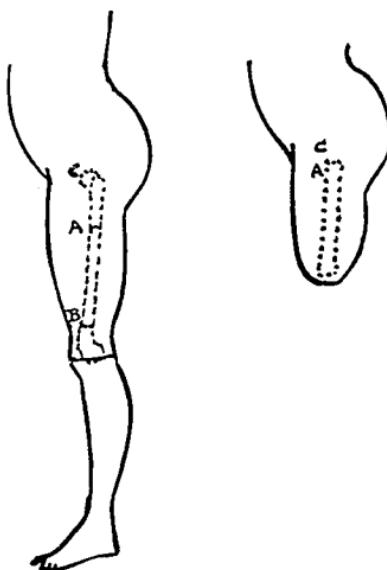


DIAGRAM ILLUSTRATING NEW METHOD OF DISARTICULATION AT HIP-JOINT.

(2) The medulla can all be scraped out through the wound made for the resection.

Some surgeons may ask, "why amputate at all for disease confined to the hip joint and its neighborhood?" That is a fair question, but it is far too large a one to be discussed at length here. I believe myself that any form of amputation for hip joint disease is very rarely justifiable. The exceptions do not all belong to the same class. The case I have related is a type of those in which the prime indication is to bring suppuration to an end by some means or other.